Witness Testimony

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Subcommittee on Environment and Hazardous Materials
February 28, 2008 1:30 PM

Thank you for the opportunity to testify before you today. My name is Jim Millette. I am an environmental scientist and have been involved with the analysis of asbestos in many types of samples since 1974. I have a degree in Physics from the University of Dayton in Dayton, OH; a Masters degree from Miami University in Oxford, OH and a Ph.D. from the school of Engineering, the University of Cincinnati. My work history includes 11 years at the US Environmental Protection Agency dealing with asbestos analysis issues. I teach a course on the analysis of asbestos by transmission electron microscopy. I am currently the chair of the American Society for Testing and Materials (ASTM – International) subcommittee D22.07 that deals with the development of asbestos methods.

My testimony today concerns U.S. legislation designed to amend the Toxic Substances Control Act concerning asbestos.

I will make five basic points in this testimony:

1. Laboratories across the US are currently performing analyses for clients using a variety of bulk asbestos analysis methods to report levels of asbestos in concentrations less than 1%.
2. There are currently methods for the analysis of asbestos in bulk samples that can achieve valid measures when the concentration at the 0.25% level. However, there are differing opinions as to the best procedure for the analysis of asbestos because some methods involve grinding or other activities that may not allow information about fiber size that some clients feel is important.
3. I support the provision in the Committee Print that “the Administrator shall issue guidance establishing the test method for purposes of compliance with this paragraph.” (page 11, (5)(B) Asbestos Test Method)
4. Apart from the questions of quantification of asbestos in bulk samples, the characteristics of what is ‘asbestos’ must be addressed by the method and universally accepted by all laboratories analyzing samples. Some proposed procedures to distinguish between asbestos fibers and ‘cleavage fragments’ have not been validated. In research work that I have conducted using one of the proposed procedures over 50% of the fibers from a sample of NIST Standard Asbestos material were rejected as non-asbestos.

5. The ASTM subcommittee D22.07 is working on developing consensus methods that will address the analysis of asbestos in bulk samples at levels less than 1%. It is my intention that the subcommittee will help to find an agreement on the definition of asbestos and the best way to measure its concentration.

Supplemental Notes.

There are over 30 different “standard” methods available for the analysis of asbestos in a variety of media. The methods include those for determining the amount of asbestos in air, water, bulk building materials, surface dust, carpet, soil and specific product materials such as vermiculite and talc. Some methods, although in draft or interim forms, have become generally recognized and used as standard methods by the analytical community. Governmental agencies such as the Occupation Safety and Health Administration (OSHA), the National Institute of Safety and Health (NIOSH), the U. S. Environmental Protection Agency (EPA), the California Air Resources Board (CARB) and the New York State Department of Health, have promulgated some of the methods. Consensus standards groups such as the American Society for Testing and Materials (ASTM), the International Standards Organization (ISO), and the American Water Works Association (AWWA) have published other methods. A number of methods have gained acceptance after being published in the scientific literature. Which method to use in a particular situation depends on the media to be tested and level of information that is required. The methods are described in more detail in Millette, J.R., “Asbestos Analysis Methods”, Chapter 2. In: Asbestos: Risk Assessment, Epidemiology, and Health Effects, R.F. Dodson and S.P. Hammar, Eds., CRC, Taylor&Francis, Boca Roton, Fl. pp:9-38, 2006

Bulk asbestos analysis performed by polarized light microscopy (PLM) methods involves identifying the type of asbestos present and then estimating the relative amount of asbestos in relation to the rest of the bulk sample. The estimates are given in terms of volume percents or, in some cases, area percents. PLM analysts practice with samples of known asbestos percentages until they can visually estimate the values on a consistent basis. The PLM visually estimated asbestos percent values do not necessarily correspond to the weight percent of asbestos in a product. When all the components of a bulk material have similar densities, then the volume percent value is expected to be similar to the weight percent value. However, if the sample contains 12% chrysotile asbestos by weight in a binder of a denser material such as calcium carbonate (limestone) then the PLM analytical result may show 30-40% asbestos by volume. Similarly, if a sample contains 45-50% chrysotile asbestos by weight in a material that contains the same weight of a lighter component such as cellulose (paper fibers) then the PLM analytical result may show 5-10% asbestos by volume. In most building products such as insulation, fireproofing, acoustical plasters and pipe covering where asbestos was intentionally added; the amount of asbestos present is significantly above 1%.

The available asbestos in soil methods can be divided into two groups: those that include a grinding step to ensure homogeneity of the sample and thereby improve the accuracy and those methods that attempt to improve the detection of asbestos in the soil without grinding. The non-grinding methods separate the soil from the asbestos to some extent while maintaining the integrity of the fiber sizes. A new method called the “Comprehensive Soil Method” (CSM) uses sieving and both light and electron microscopy to gather information about the wide range of fiber sizes that may be present in soil samples. The

Comprehensive Soil Method involves wet sieving with 1mm and 250µm sieves to generate 4 separate sub-samples for analysis: Coarse fraction (>1mm), Intermediate fraction (<1mm >250µm), Fine fraction (<250µm) and Decant fraction (the decant water from the coarse and intermediate fractions). Each size fraction, coarse, intermediate, fine, and the decant fraction is analyzed by polarized light microscopy (PLM). If no asbestos is detected in these fractions, the fine fraction is then analyzed by transmission electron microscopy (TEM) to determine if asbestos is present within the sample.

In order to test the CSM, a total of 50 soil samples were spiked with concentrations of 0.1% and 0.01% chrysotile and crocidolite asbestos. Of the 50 samples tested, using three different soils, both crocidolite and chrysotile asbestos were detected in all samples where 0.1% and 0.01% of each type of asbestos was added. The testing also found that fiber length, width and aspect ratio information could be obtained from all the samples.

The accuracy of the Comprehensive Soil Method, as determined by the recovery of the 0.1% asbestos spike, ranged from 110% to 540%. Because it uses the PLM estimating procedures for quantification, the CSM tends to overestimate the amount of asbestos in the way that has been reported for polarized light microscopy methods in the scientific literature. One study of a number of laboratories reported overestimation for bulk asbestos PLM tests of 4 to 5 times for concentrations of 1% asbestos. These accuracy values when calculated according to the equation used in these studies are 300% and 400%. This suggests that the Comprehensive Soil Method at the 0.1% asbestos concentration level has a similar accuracy as the standard EPA bulk PLM method at the 1% asbestos concentration level. The accuracy of the CSM at the lower sensitivity level of 0.01% is poor. This appears to be a basic problem with the visual PLM asbestos estimation procedure. The analyst is able to detect low concentrations of asbestos fibers but the ability to visually estimate the amount is very poor at the lower concentrations of asbestos present.

JAMES R. MILLETTE, Ph.D.
Summary of Credentials

EDUCATION:

B.S., Physics, University of Dayton, Dayton, Ohio, 1973
M.En., Miami University, Oxford, Ohio, 1975
Ph.D., University of Cincinnati, Ohio, 1983

WORK EXPERIENCE:

- Involved in environmental/toxicology/particle and materials studies since 1972 primarily using electron microscopy techniques.
- Present position: Executive Director, MVA Scientific Consultants, Duluth, Georgia.
- Previous work included 11 years as a research scientist at the U.S. Environmental Protection Agency Research Center in Cincinnati, Ohio and 5 years at McCrone Environmental Services performing and supervising analysis of particulates and product constituent analysis by microscopic techniques.

PUBLICATIONS:

Over 60 publications have appeared in a number of journals including Scanning Electron Microscopy, Journal of the American Water Works Association, Environmental Health Perspectives, Archives of Environmental Contamination and Toxicology, the Science of the Total Environment, Journal of Analytical Toxicology, Electron Microscopy, and The Microscope.

PRESENTATIONS:

Reports of scientific work have been presented at numerous national and international meetings, including conferences of the Environmental Information Association, American Industrial Hygiene Association, American Water Works Association, Electron Microscopy Society, and several Symposia of the Georgia Tech Research Institute.

OTHER:

- Served as chairman or co-chairman of technical sessions at national meetings such as that of the Electron Microscope Society of America.
- Chairman, Electron Microscope Facility at the USEPA Research Center, 1980-1985.
- Member of American Society of Testing and Materials. Chair for ASTM Committee D22.07 Asbestos. Member ASTM Committee D24 Carbon Black.
- Testified as an expert witness on asbestos for the State of Connecticut Department of Health.
- Adjunct Professor, Department of Zoology, Miami University, Oxford, Ohio, 1984-1985.
- President, Electron Microscope Society of the Ohio River Valley, 1984-1985.
- President, Georgia Microscopical Society, 1994-1996.

- Testified as an Expert Witness on matters relating to microscopical analyses in court.
- Co-Course Director, "Settled Dust Analysis," Georgia Tech Research Institute, 1992.
- Lecturer for ASTM Technical & Professional Training Course.
- Fellow of the American Academy of Forensic Scientists - Andrew H. Payne, Jr., Special Achievement Award. Feb 20, 2008